tural qualities and representative uses. These will prove of value to both expert and amateur.

From its title one might be led to suppose that the book was an addition to the literature of strict forest botany, but the preface states that "It is intended for those who are not foresters or botanists, but who use woods or desire a knowledge of their distinguishing properties." The preface further states that "Although great care has been taken to check each fact, errors no doubt exist, although it is not believed that there are important ones." We cannot entirely agree with the author in this. For example, in the introduction we are told that a true wood fibre originates from several cells, "a resin duct is a cell structure or a fibre," "a vessel is a short wide tube joined vertically end to end with others of its kind."

Inaccuracy and vagueness of expression are to be found elsewhere in the book. For instance, "Europeans regard the Ash for ornamental purposes, but Americans value it for wood" is an error that may perhaps be excused in an American writer, but why should the leaves of Eucalyptus be described thus?—"Those of young blue gums are bright blue, oval and stalkless, while leaves of older trees have stems (*sic*), are dark green and sickle-shaped."

Attention is further directed in the preface to the fact that "Allusions to trees, historical and other references, aside from those directly regarding woods, are made for completeness and in order to mark, distinguish, or separate the species." The author fails to realise this object. The distinguishing characters given are far too vague and general to be of any practical value.

On the whole the book contains much useful information and statistics regarding the various species of wood, both broad-leaved and coniferous. It would have been much better, however, had the author confined himself to the treatment of this aspect of the subject alone, leaving out all botanical and other technical matter.

Lehrbuch der Mikrophotographie. By Dr. Carl Kaiserling. Pp. viii + 179. (Berlin: Gustav Schmidt, n.d.) Price 4 marks.

ALTHOUGH there are several well-known treatises on this subject, it is doubtful whether any exceed in thoroughness the one now under notice. The essential conditions for the production of photomicrographs of the highest class are carefully described, and each part of the process is treated fully.

There is no more important point than the illumination of the object itself, and both the source of light and its colour should be selected to bring out the desired points in the resulting photographs.

This part of the subject is generally treated all too briefly, but in the present instance its importance is evidently recognised. The various ways of making light filters and their use with coloured preparations are described. The method of arriving at the proper filter to use with a given preparation is stated to be by determining the absorption spectrum of the dye used for staining, by aid of a hand spectroscope, and then adapting the light filter to give the result desired. This is undoubtedly the only scientific method of using colour screens in photomicrography, and one which we have adopted with success for some time past.

The various types of apparatus by the leading makers are fully described, prominence being naturally given to continental firms. Instructions as to the use of substage apparatus, methods of centring, choice of objectives, and the combination of microscope and camera are included, while it is satisfactory to note that no space is unnecessarily wasted over purely photographic processes. Altogether the book may be recommended to photomicrographers as one of the best yet published. J. E. B.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Source of Radium Energy.

THE novel and unforeseen property of radium of producing energy, which purely kinetic theories, in opposition to the notion of inherent force as a transcendental element, do not seem able to explain, is perhaps destined to give a fresh impetus to discussion from the two distinct points of view. It is meanwhile to be noted with regard to this, that the notion of force acting at a distance from point to point, being equal and reciprocal between the various material points, does not appear to be any better met by the manifestation of the unfailing energy of radium than the simple movements of the kinetic theory. This remark justifies attention being directed to a view of the natural physical forces presented by the present writer more than ten years ago (see Lagrange's "Study of the System of Physical Forces," forming vol. xlviii. of the *Memoirs* of the Royal Academy of Sciences of Belgium). It is there shown that forces exist of such a nature that static equilibrium is impossible, on the impact of bodies of different composition, at their surfaces of contact. They are forces making a body, after the example of radium, emit rays unceasingly without apparent loss of substance. A force of repulsion is referred to here, emanating from the surface, and not from the centre of the mass of atoms, acting on opposed surfaces, and the varying intensity of which is nothing else than what is known to science as absolute temperature. That repulsive force, acting in the inverse ratio of the volume of matter (or of the cube of the distance), just as Newtonian gravitation acts in the inverse ratio of the surface (or as the square of the distance), takes its immediate development, and to some extent visible shape, in Mariotte's law of the relation of pressure to volume in gases. The memoir establishes the existence of a continuous interatomic medium of transcendental qualities not yet understood, conveying the effect of a force acting at the surface of atoms, and the real seat of luminous and electromagnetic wave motion, according to the views to which clearly Lord Kelvin has of late returned. The view now presented is entirely deduced from analysis of the actual facts, worked out at length, and justified by the memoir, and new so far as the case of the impossibility of an equilibrium due to the surface force of repulsion, which gives rise to an exhaustless emission of energy. The reflecting attention of physicists may therefore be legitimately directed to the subject, because it seems certain that the new properties which radium manifests are not explainable by the kinetic hypothesis, but, on the contrary, are of a nature henceforward to modify considerably the speculations of modern physics.

Brussels, July 14. CH. LAGRANGE.

A New Case of Phosphorescence induced by Radium Bromide.

IT is known that salt (NaCl) at a temperature of 200° C. is phosphorescent (*vide* Phipson on "Phosphorescence," p. 20); during a course of experiments in June last I found that radium bromide induces phosphorescence at ordinary temperatures. The following is a convenient way of observing the phenomenon. Fill a wooden match-box with table salt removed from the inner portion of a block; press the radium bromide tube into the yielding mass and just barely cover it with the substance. If it be now put on one side for a few hours, say into one of the compartments of a chest of drawers, on opening the box in the dark all round the tube will be found to phosphoresce with a white light, but, unlike zinc blende and barium platinocyanide, the salt continues visibly to phosphoresce after removal of the radium bromide. The portions of salt round the tube are turned of a faint buff or ochrey tint. The image of the visible portion round and where the radium bromide tube has lain is impressed on a photographic plate in thirty

minutes, but only very faintly in two or three minutes. I have tried samples of salt from several localities with the same results.

WILLIAM ACKROYD.

Tables of Four-figure Logarithms.

I AM much interested by the short letter, contributed by Prof. Perry to NATURE of July 2 (p. 199), on the subject of four-figure logarithms, especially as I have myself offered a solution of the difficulty which Mr. Harrison has essayed to remedy. If, instead of using Bottomley's differences for the upper part of the tables, viz. from 1000 to 1799, we resort to the usual tabular differences found in any ordinary logarithmic tables, such as Chambers's, we get an even greater accuracy than does Mr. Harrison. The tables are naturally weakest when we have a "9" for the fourth figure of the number the logarithm of which is required. Taking this as a test, between 1000 and 1799 the accuracy of the three methods may be expressed thus:—

	Per cent.
Bottomley's differences	37·5
Ditto, Harrison's extension	58·5
Ordinary tabular differences	76

Tabular differences would be required corresponding to logarithmic differences of 43 to 24 inclusive, *i.e.* twenty small columns of differences. It may be objected that it would be unwieldy in use to change from one method of procedure to another, but I think it will be found, also, that Mr. Harrison's tables are not so easy to use as the unmodified ones. The tabular differences might, indeed, be printed down the side of Bottomley's table without disturbing the usual differences, and only be used when the best possible accuracy is desired.

One of the best solutions of the difficulty has been suggested to me by Prof. Perry himself, viz. divide the number, less than 2000, the logarithm of which is wanted, by 2, and add together the logarithms of quotient and divisor. The approximation to the true logarithm of the number is very good.

I cannot agree that chemists, in any case, should use four-figure logarithms, seeing that they habitually return four figures as significant. I hope, before long, to be able to show that practicable five-figure tables can be constructed to which the reproach of "size" will be inapplicable.

July 3. M. WHITE STEVENS.

PROF. PERRY in NATURE of July 2 (p. 198) gives an illustration of a method whereby the logarithms of the numbers from 1000 to 2000 may be got from a four-place logarithm table with an error of, at most, one unit in the last place.

It is, however, somewhat difficult to see what advantage this arrangement has over the one where the logarithms of the numbers 1000 to 2000 are given (again) after 999 *in extenso* without proportional parts.

By this latter system the tables are certainly increased in size by another double page, but, on the other hand, there is a decided disadvantage in using the relatively large proportional parts for the numbers 1000 to 2000. If the addition of the proportional parts is done on paper, time will be lost; if the addition is done mentally, mistakes may easily occur.

C. E. F.

Edinburgh, July 4.

IN mathematical tables the last figure in any tabulated number or difference must be liable to an error $\pm\frac{1}{2}$. When a number is extracted from the tables by aid of a tabulated difference, the result is subject to a duplication of error, that is, to an error ± 1. It will be found on examination that in some of the early numbers of the ordinary four-figure log tables the error is often double this amount. Mr. Harrison's alteration remedies this mistake, and makes the maximum error uniform throughout. The scheme proposed by Mr. Stevens can do no more than this, and would be more clumsy. The figures given by him apparently refer to averages, and are irrelevant.

If the proposal of C.E.F. were adopted, the first portion of the table would have double the accuracy of the remainder; the result of any general calculation would depend on the accuracy of the latter, and little, if anything, would be gained in return for the fact that the space occupied by the tables would be doubled.

JOHN PERRY.

A Multiple Lightning Flash.

I HAVE had the privilege of examining the print of the lightning flash taken by Mr. C. H. Hawkins, of Croydon, and referred to in NATURE (July 16, p. 247) by Dr. W. N. Shaw.

The main flash consists really of *three* flashes, the several paths of which are not quite coincident. If a moving camera had been employed (I assume the camera in this case was fixed), then I think the three flashes would have been easily distinguished. The flash on the right is evidently a ramification of the main stream. Except for the above, the photograph shows no other special features.

WILLIAM J. S. LOCKYER.

Solar Physics Observatory, July 17.

The Lyrids, 1903.

THE return of the Lyrids this year was well observed here. Watching was begun on April 15, and continued until April 24, the series being broken only once, namely on April 20, when the sky was overcast. The weather was very favourable, the heavens on most nights being beautifully clear. Eighty-four meteors were registered, of which twenty were Lyrids.

The chief points with regard to the Lyrids brought out by the observations are:—

(1) The display was of moderate strength.

(2) The maximum occurred on April 21 and 22, probably more precisely at midnight on the latter date.

(3) The decrease in activity was more rapid than the rise to maximum.

(4) The radiant on the nights of April 21–22 was at $271\frac{1}{2}^\circ + 33^\circ$ (12 paths).

(5) The colours of the Lyrids were almost wholly of two shades, white and a peculiar yellowish, dirty-looking green.

(6) The meteors were swift, their average angular velocity being 20° a second, not taking into account those which appeared close to the radiant. The real speed of a Lyrid fireball recorded on April 22 by Prof. Herschel at Slough and the writer at Leicester has been computed to have been 39 miles per second.

(7) Only the very brightest Lyrids left streaks.

The first meteor of the shower was observed on April 17. There was a remarkable break on April 19, when not a single Lyrid was seen in a watch lasting three hours, though the seeing was excellent.

Minor Showers.

Besides the Lyrids, radiants were found for the chief active showers as under:—

Radiant-point	Duration	No. of meteors	Remarks
$330^\circ + 35^\circ$ ...	March 29–April 24 ...	4 ...	Slowish; radiant well-defined.
$216 - 26$ ...	April 11–24 ...	5 ...	Rather swift, bright, long. Exhibited great variety of colour.
$236\frac{1}{2} + 51\frac{1}{2}$ ...	April 19 ...	4 ...	Short; rather swift. Radiant sharply defined.
$256\frac{1}{2} + 37$ ...	April 19–22 ...	6 ...	Swift. Maximum April 22 (5 meteors).

The shower from 216°–26° is very interesting, inasmuch as nothing seems to have been seen of it previous to 1900, in which year it was very active at the Lyrid epoch from 218°–31°. It appears, therefore, to furnish quite a strong display at this period.

A recent writer has calculated that the maximum of the Lyrid shower would fall this year at April 19, 10h. 30m. My observations entirely negative this conclusion, for that night was marked by the complete absence of Lyrids, though the seeing conditions were extremely favourable. The time of maximum actually found was in accordance with that which had previously been inferred. Since in the last few years the maximum has taken place on the 20–21, it was to be expected that, after the omission of leap year in 1900, the epoch would be thrown one day later.

ALPHONSO KING.

Leicester, July 11.